VAKOLYUK, M. I.

"The Effect of Somnolent Inhibition on Restoring the Processes of Internal Organs (in the Saliva Secreting Apparatus) After Functional Exhaustion." Cand Med Sci, Inst of Physiology, Acad Sci Ukrainian SSR, Kiev, 1953. (RZhBiol, No 3, Feb 55)

SO: Sum. No. 631, 26 Aug 55 - Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (14)

VAKOLYUK, M.I.

Protective inhibition and process of recovery following fatique.
(MLRA 8:1)
Vop. fiziol. no.6:32-39 '53.

1. Otdel normal'noy fiziologii Instituta fiziologii im. A.A. Bogomol'tsa AN USSR.
(FATIGUE, physiology,
eff. of sleep on recovery)
(SLEEP, effects,
on fatigue)

VAKOLYUK, N.I.

Effect of sleep inhibition on restorative processes in the internal organs in chronic deficiency diseses. Vop. fiziol. no.7:50-53 '54. (MLRA 8:1)

1. Institut fiziologii AN USSR.
(DEFICIENCY DISEASES, experimental,
eff. of sleep)
(SLEEP, effects,
on exper. defic. dis.)

VAKOLYUK, N.T.

Effect of conditioned reflex on the course of restoration following functional emaciation. Vopr.fiziol. no.8:64-70 '54. (MIRA 14:81)

1. Institut fiziologii AN USSR.
(NUTRITION DISORDERS, experimental,
emaciation, eff. of sleep in dogs)
(SLEEP, effects,
on exper. emaciation in dogs)

VAKOLYUK, N.I.

Reinforcement of restorative processes during sleep. Vopr.fiziol. no.9:95-99 '54. (MIRA [illegible])

1. Institut fiziologii im. A.A. Bogomol'tsa Akademii nauk USSR, Laboratoriya vysshey nervnoy deyatel'nosti.

(SLEEP, effect,
restorative action, reinforcement)

VAKOLYUK, N.I.

Importance of the duration of sleep for its effectiveness in restorative processes. Fiziol.zhur. (Ukr.) 1 no.1:54-56 Ja-F '55. (MIRA 9:9)

1. Institut fiziologii imeni akademika O.O.Bogomol'tsya Akademii nauk URSR, Laboratoriya vishchoi nervovoi diyal'nosti.
(SLEEP)

VAKOLYUK, N.O. [Vakoliuk, N.I.]

Conference on problems in the physiology of fatigue and restorative processes. Fiziol. zhur. [Ukr.] 6 no.3:427-428 My-Je '60. (MIRA 13:7)

(PHYSIOLOGY--CONGRESSES) (FATIGUE)

VAKOLYUK, N.I.

Method of simultaneous recording of several indicators of salivary gland activity. Fiziol. zhur. [Ukr.] 9 no.6:829-830 N-D '63. (MIRA 17:8)

1. Laboratoriya vysshey nervnoy deyatel'nosti cheloveka i zhivotnykh Instituta fiziologii im. Bogomol'tsa AN UkrSSR, Kiyev.

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001858410019-4"

SERKOV, F.N.; YAKOLYUK, N.S.

Capacity of human blood to synthetize acetylcholine. Vop. fiziol. no.6:115-119 '53. (MLRA 8:1)

1. Kafedra normal'noy fiziologii Vinnitskogo gosudarstvennogo meditsinskogo instituta.

(ACETYLCHOLINE, physiology, synthesis in blood)
(BLOOD, physiology, acetylcholine synthesis)

MAKOLYUK, N.Y.

Modified method for esophagotomy. Fiziol.zhur. [Ukr.] 3 no.1:136-137 Ja-F '57. (MLRA 10:3)
(ESOPHAGUS--SURGERY)

VAKOLYUK, V.D., assistent

Morphology of Purkinje fibers in the conducting system of the human heart in ontogenesis. Sbor.nauch.trud.Vin.der.med.inst. 18 no.1:125-132 '58. (MIRA 16:2)

1. Kafedra gistologii i embriologii (zav. kafedroy doktor med. nauk, prof. I.V. Almazov) Vinnitskogo gosudarstvennogo meditsinskogo instituta. (HEART—MUSCLE)

VAKOLYUK, V.D., assistent

Structure and development of Purkinje fibers in the conducting system of the heart in dog. Sbor.nauch.trud.Vin.der.med.inst. 18 no.1:133-136 '58. (MIRA 16:2)

1. Kafedra gistologii i embriologii (zav. kafedroy doktor med. nauk, prof. I.V. Almazov) Vinnitskogo gosudarstvennogo meditsinskogo instituta.
(HEART—MUSCLE) (DOGS—ANATOMY)

VAKRCKA, R.

Ventilation of mills and its effect on output per hour. p. 123. STAVIVO. (Ministertvo stavebnictvi) Praha. Vol. 34, no. 4, April 1956.

SOURCE: East European Accessions List, (EEAL), Library of Congress. Vol. 5, no. 12, December 1956.

Q

USSR / Farm Animals. Cattle.

Abs Jour : Ref Zhur - Biologiya, No 5, 1959, No. 21215

Author : Vakrushev, N. S.
Inst : Not given
Title : Problems of Raising the Standard of Public Animal Husbandry of BMASSR (Buryat Mongolian Autonomous Soviet Socialist Republic)

Orig Pub : V sb.: Materialy po nauch. proizvodit. sil Buryat-Mong. ASSR. Vyp. 3, Ulan-Ude, 1957, 455-472

Abstract : No abstract

Card 1/1

28

VAKHRUSHEV, V.A.

Principles of the genetic classification of contact-metasomatic iron ore deposits in the Altai-Sayan region. Geol. rud. mestorozh. 5 no.6:3-8 N-D'63. (MIRA 17:5)

1. Institut geologii i geofiziki Sibirskogo otdeleniya AN SSSR, Novosibirsk.

VAKS, A.I., TEREKHOVA, L.I.

Machining spindles for machine tools. Stan.i instr. 31 no.4:11-18 Ap '60. (MIRA 13:6)
(Spindles (Machine tools))

BAZILEVSKIY, Sergey Aleksandrovich; ASHIK, V.V., prof., doktor tekhn. nauk, retsenzent; VAKS, A.I., inzh., retsenzent; REYNOV, M.N., nauchn. red.; OSVENSKAYA, A.A., red.; KRYAKOVA, D.M., tekhn. red.

[Theory of errors occurring during the design of ships] Teoriia oshibok voznikaiushchikh pri proektirovanii sudov. Leningrad, Izd-vo "Sudostroenie," 1964. 261 p. (MIRA 17:3)

VAKS, A.M.; ILYUKHINA, V.N

Interdependence between the content of leached tanning agents and that of the spent tanning solution. Leg.prom. 15 no.12:29-30 D '55. (MLRA 9:5)

(Tanning)

VAKS, B.G.

Ways to reduce expenditures for supplying natural gas to enterprises. (MIRA 17:10)
Gaz. prom. 9 no.9:37-39 '64.

VLADZIYEVSKIY, A.P., doktor tekhn. nauk, prof.; YAKOBSON, M.O., doktor tekhn. nauk, prof.; VAKS, D.I., inzh.; VASINA, V.G., inzh.; POCHTAREVA, A.V., red. izd-va; TIKHANOV, A.Ya., tekhn. red.

[Unified system of preventive maintenance and efficient operation of the tehnical equipment of machinery manufacturing enterprises] Edinaia sistema planovo-predupreditel'nogo remonta i ratsional'noi ekspluatatsii tekhnologicheskogo oborudovaniia mashinostroitel'nykh predpriiatii; tipovoe polozhenie. Izd.4. Moskva, Mashgiz, 1962. 734 p. (MIRA 15:6)

1. Moscow. Eksperimental'nyy nauchno-issledovatel'skii institut metallorezhushchikh stankov.

(Machinery--Maintenance and repair)
(Machinery industry--Management)

VAKS, D.I.

Seminar of factory laboratories. Stan. i instr. 35 no.3:
48-3 of cover. Mr '64. (MIRA 17:5)

L 37225-66 EWP(k)/EWT(d)/EWT(m)/EWP(h)/T/EWP(l)/EWP(v)/EWP(t)/ETI IJP(c) DJ/JD

ACC NR: AP6018269 SOURCE CODE: UR/0121/66/000/002/0020/0022

49
45
B

AUTHOR: Vaks, D. I.

ORG: None

TITLE: Work done by technological laboratories in plants

SOURCE: Stanki i instrument, no. 2, 1966, 20-22

TOPIC TAGS: machine tool, metalworking machinery, lathe, grinding, boring machine, roller bearing, permanent magnet material

ABSTRACT: The author discusses work done by the technological laboratories of machine-tool building plants in improving the quality, reliability and durability of metal-working machines and striving for more efficient machining and assembly operations. Several examples are given. The technological laboratory of the "Krasnyy proletariy" Plant has developed a process for lapping cylindrical roller bearings of spindles for precision screw cutting lathes. GOI paste is used for lapping. Experimental work on lapping rollers for grinder bearing races is in progress at the laboratory of the Plant im. Il'ich. A complex method for balancing chucks of precision screw cutting lathes has been developed at the laboratory of the "krasnyy proletariy" Plant. The technological laboratory of the Milling Machine Plant im. Kirov has worked out a method for replacing manual lapping of external surfaces by precision grinding. Experimental

UDC: 621.9.001.5

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ACC NR: AP6018269

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grinding with EB16SM2, EB12SM2 and EB25SM grinding discs shows that precision grinding can replace manual lapping. This can be done only if certain conditions are satisfied. These conditions are fully discussed. Work has been done to increase precision and reduce production time in making steel friction discs at the laboratory of the Minsk Transfer Machine Plant. The laboratory of the Plant im. Sedin has developed a method for transferring the process of boring holes in frame members from horizontal boring machines to radial boring machines. The work of other laboratories is described, dealing with such subjects as development and use of attachments with permanent magnets, determining the efficiency of using coolants, and others. Orig. art. has: 1 figure.

SUB CODE: 13/ SUBM DATE: none/ ORIG REF: 002/ OTH REF: 000

Card 2/2

VAKS, I.A.

The SGP-1-57 automatic gas-brazing machine. Biul.tekh.-ekon. inform. no.11:25-26 '58. (MIRA 11:12)
(Brazing)

S/135/62/000/006/013/014
A006/A106

AUTHORS: Vaks, I. A., Berson, L. M., Kontsov, A. I., Engineers

TITLE: Exchangeable cantilevers for МТПТ (MTPT)-type spot welding machines

PERIODICAL: Svarochnoye proizvodstvo, no. 6, 1962, 37 - 38

TEXT: To eliminate deficiencies occurring in the use of conventional tongs for welding light alloys, such as labor-consuming operation, overheating of contacts, poor quality of welds, the authors have developed a new design of tongs for welding light and copper alloys, 0.8 - 1.5 mm thick. The tongs consist of two B95 AT (V95AT) arms. The electrodes are fixed in holders and are water-cooled. The maximum operational path of the upper electrode is 200 mm. In one minute 20 spot-welds can be produced. The tongs can be easily mounted on MTPT and MTIP type welders. Conditions for spot welding D19AT are given below. There are 2 figures and 1 table.

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Exchangeable cantilevers for...

S/135/62/000/006/013/014
A006/A106

Table.

| Thickness of metal to be welded in mm | Electrode diameter in mm | Radius of electrode sphere in mm | Force on the electrodes in kg | Time of welding current passage in sec | Welding current in kamp | Minimum diameter of spot nucleus in mm | Shearing strength of spot in kg |
|---|---|---|---|---|---|---|---|
| 0.8 | 8 | 40 | 220 | 0.04 | 19 | 3.5 | 140 |
| 1.2 | 10 | 75 | 320 | 0.08 | 22 | 5.0 | 200 |
| 1.5 | 12 | 75 | 450 | 0.10 | 25 | 5.5 | 300 |

Card 2/2

VAKS, I.A., inzh.; BERSON, L.M., inzh.; KONTSOV, A.I., inzh.

Electric furnace for making AN-T type fluxes. Svar. proizv. no.8: 28 Ag '62. (MIRA 15:11)
(Flux (Metallurgy)) (Electric furnaces)

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001858410019-4"

VAKS, I.A., inzh.; HERSON, L.M., inzh.; KONTSOV, A.I., inzh.

Modernized oscillator with regulated power output. Svar.proizv. no.11:38-39 N '62. (MIRA 15:12)
(Oscillators, Electric)

L 32688-66 EWT(d)/EWT(l)/EWT(m)/EWP(c)/EWP(v)/T/EWP(t)/ETI/EWP(k)/EWP(l)
ACC NR: AP6012283 (N) SOURCE CODE: UR/0125/65/000/011/0048/0051
IJP(c) JD/WW/HM/JG

AUTHOR: Orlov, B. D.; Dmitriyeva, G. M.; Vaks, I. A.

ORG: Moscow Aviation Technological Institute (Moskovskiy aviatsionnyy tekhnologicheskiy institut)

TITLE: Nondestructive testing of the fused zone of welded titanium alloy joints

SOURCE: Avtomaticheskaya svarka, no 11, 1965, pp 48-51

TOPIC TAGS: titanium alloy, nondestructive testing, weld evaluation, trace analysis, radiography/OT4 titanium alloy, VT1 titanium alloy

ABSTRACT: For an overwhelming majority of resistance-welded structural materials the physical properties of the fused zone (e.g. x-ray attenuation factor, propagation rate of ultrasonic vibrations, ferromagnetic characteristics, etc.) of the weld nugget and the base metal are virtually identical. Hence, the known defectoscopic methods cannot effectively be used to determine the boundary of the fused zone, i.e. the spot diameter (in spot welding)or the seam width (in seam welding); they merely make it possible to detect cracks, pores and other, generally secondary, characteristics of the welded joints, without detecting the presence or absence of the principal and most dangerous defect -- poor penetration. In this connection the authors de-

Card 1/2 UDC: 621.791.763.004.5.658.562

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ACC NR: AP6012283 4

scribe a newly developed nondestructive testing method, based on the artificial magnification of the difference between the physical properties of the fused zone and those of the surrounding metal by means of the prior addition of a metallic tracer (MT) which interacts with the molten metal of the weld pool and thus alters, e.g. the overall light-and-shadow contrast picture of the welded joint on the radiogram. This idea was tested out with positive results on welded joints of OT4 and VT1 titanium alloys for which the MT used were metals with a high x-ray attenuation factor and a much higher m.p. than that of Ti -- W, Mo, Ta, Nb, and particularly Zr. These metals can be applied in various ways: by deposition in the form of a powder or foil, etc., and, despite their higher melting points (compared with Ti) they satisfactorily melt and uniformly dissolve in the weld pool, thus assuring a reliable and simple nondestructive inspection of the dimensions of the fused zone of spot- and seam-welded joints. Orig. art. has: 7 figures, 1 table.

SUB CODE: 11, 13 SUBM DATE: 03May65/

Card 2/2 BLG

ACC NR: AP6025650 (A) SOURCE CODE: UR/0413/66/000/013/0100/0100

INVENTOR: Orlov, B. D.; Dmitriyeva, G. M.; Vaks, I. A.

ORG: None

TITLE: A metallic indicator for inspection of resistance welding. Class 42, No. 183463

WOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 13, 1966, 100

TOPIC TAGS: weld evaluation, x ray analysis, metal powder, zirconium, niobium

ABSTRACT: This Author's Certificate introduces a metallic indicator for inspcetion of resistance welding. This indicator is used in combination with x-ray analysis to check for incomplete melting and to determine the dimensions of the weld zone in spot and roll joints of parts made from titanium alloys without destroying them. The material is designed for improving quality control while simultaneously maintaining the strength of the welded joint by using industrial zirconium powder or a powdered alloy of 75% niobium with 25% zirconium. This powder is added to the weld zone in quantities of 0.5-1.5% of the molten core at each point.

SUB CODE: 13, 11/ SUBM DATE: 18Jan65

Card 1/1 UDC: 620.179.152

IVANOVA, Irina Vladimirovna; TOROPKOV, Vadim Vasil'yevich; VAKS, I.A., dots., red.; FREGER, D.P., red. izd-va; BELOGUROVA, I.A., tekhn. red.

[Aesthetics in technology; a bibliography]Estetika v tekhnike; bibliograficheskii ukazatel'. Sost. I.V.Ivanova i V.V.Toropkov. Pod red. I.A.Vaks. Leningrad, 1962. 34 p. (MIRA 15:11)

1. Leningradskiy dom nauchno-tekhnicheskoy propagandy. Nauchno-tekhnicheskaya biblioteka.
(Bibliography--Factories--Lighting)
(Bibliography--Color--Physiological effect)

VAKS, I.Ya.

Tower cranes for tie loading. Put' i put.khoz. 4 no.3:35-36 Mr '60. (MIRA 13:5)

1. Nachal'nik shpalopropitochnogo zavoda, g.Tomsk.
(Cranes, derricks, etc.) (Railroads--Ties)

LUVISHIS, T.N., starshiy nauchnyy sotrudnik, kand.tekhn.nauk; VAKS, L.M., mladshiy nauchnyy sotrudnik

Laboratory method for determining the shrinkage of wool and semiwool fabrics after soaking in water. Tekst.prom. 22 no.2:73-75 F '62. (MIRA 15:3)

1. TSentral'nyy nauchno-issledovatel'skiy institut sherstyanoy promyshlennosti.

(Wool--Testing)

LUVISHIS, L.A., kand. tekhn. nauk; VAKS, L.M., inzh.

Laboratory method for determining the shrinkage of woolen and blended wool fabrics after soaking in water. Nauch.-issl. trudy TSNIIShersti no.17:134-138 '62. (MIRA 17:12)

VAKS, M.A. (Moskva)

Activities of a plant producing galenic preparations. Apt.delo 3 no.3:39-40 My-Je '54. (MLRA 7:6)

1. Direktor farmatsevticheskoy fabriki.
(DRUG INDUSTRY,
*in Russia, plants prod. galenic prep.)

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

CA

18

**Potassium fluozirconate.** I. Ya. Bashilov, A. Sh. Vaks and E. A. Pepelyaeva. Russ. 53,515, July 31, 1938. A soln. of $Zr_3(PO_4)_4$ is treated with HF and then with $K_2CO_3$.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

**Rare earth fluorides.** A. Sh. Vaks. Russ. 52,800, March 31, 1938. Lovchorrite is decompd. with acid, $TiO_2$ is sepd. by hydrolysis in dil. acidic medium, and the soln. is treated with $AlCl_3$ to prevent the sepn. of $CaF_2$ in the pptn. of the fluorides of rare earths with HF.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

VAKS S.A.

S/180/60/000/02/028/028
E071/E135

AUTHOR: Ogurtsov, S.V.

TITLE: Scientific Conference on the Metallurgy, Chemistry and Electrochemistry of Titanium

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, Nr 2, pp 167-168 (USSR)

ABSTRACT: The conference took place on January 14-20 1960 in Moscow in the Institute of Metallurgy, Academy of Sciences, USSR. It was organised by the Committee for Coordination of Scientific Research on Titanium. About 400 representatives of academic and research institutions and works participated in the conference. The conference was divided into four sections: 1) raw materials and smelting of ores; 2) chemical technology and chlorination; 3) metallothermic methods of smelting titanium; and 4) electrolysis. The following papers were read: Metallurgical evaluation of some new deposits (B.B. Dmitrovskiy); State and prospects of improving the technology of smelting of ilminite concentrates (V.A. Reznichenko and V.I. Solov'yev);

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Thermodynamic investigations of titanium compounds (P.B. Khalimov and V.A. Reznichenko); An investigation of the process of reduction of iron-titanium concentrates with carbon (M.B. Rapoport); Some hydrodynamic and kinetic features of the process of chlorination of titanium dioxide in molten chlorides (Kim Men-rin); Oxidation of titanium tetrachloride with oxygen (O.S. Movnov, B.N. Melent'yev, V.A. Reznichenko); Utilisation of ilminite concentrates for the production of titanium dioxide pigment by the sulphuric acid method (M.L. Borodina, S.B. Shaykevich, N.A. Gubarova); An investigation of some properties of the system $TiCl_4$ - $AlCl_3$ - $FeCl_3$ (N.K. Drushinina); An investigation of phase equilibria liquid-vapour in systems formed by titanium tetrachloride with chloroanhydrides of mono- and tri-chloroacidic acids (G.V. Seryakov, S.A. Vaks, L.S. Sidorina); Determination of the summary content of carbon in titanium tetrachloride (G.V. Seryakov, S.A. Vaks, I.M. Golovanov); Basic conditions for standardised

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results of the process of production of titanium by the magnesium thermite method (S.V. Ogurtsov, V.A. Reznichenko, V.K. Ustinov, V.I. Kozhevnikov, A.I. Dedkov); On the two stage method of production of titanium by the sodium thermite method (V.A. Reznichenko, S.V. Ogurtsov); Production of a high purity titanium (V.I. Batashev); The influence of the content of chlorine in a high purity titanium sponge on the process of smelting and on the quality of the metal produced (G.M. Vaynshteyn); The production of titanium and its alloys by refining of black anodes (Academician I.P. Bardin, A.D. Ehremov, V.I. Lukashin); On the theory of refining of titanium (V.A. Suknodskiy); Production of titanium by electrolysis of titanium dioxide in fluoride-chloride melts (I.P. Bardin, A.A. Kazayn); Electrolytic production of titanium from chloride-fluoride melts (V.M. Ioffe, N.N. Rozanov, N.A. Lyubimova); Electrolytic refining of titanium waste products (V.M. Lozovatskiy); and a number of other reports.
There are no figures, tables or references.

Card 3/3

S/079/60/030/007/003/020
B001/B063

AUTHORS: Seryakov, G. V., Vaks, S. A., Sidorina, L. S.

TITLE: Study of the Phase Equilibria "Liquid - Vapor" in Systems Formed by $TiCl_4$ With Acid Chlorides of Mono- and Trichloroacetic Acids

PERIODICAL: Zhurnal obshchey khimii, 1960, Vol. 30, No. 7, pp. 2130-2133

TEXT: According to data of various publications acid chlorides of chloroacetic acids may be present in commercial $TiCl_4$ obtained by the chlorination of oxides in the presence of coal (Refs. 1,2). In the paper under abstraction, the authors study the phase equilibria "liquid - vapor" in the binary systems $TiCl_4$ - $CH_2ClCOCl$ and $TiCl_4$ - $CCl_3COCl$ in order to determine the effect of rectification used in purifying $TiCl_4$ from these admixtures. At the same time, the authors determined the vapor pressures of mono- and trichloroacetyl chlorides, as well as of titanium tetrachloride at various temperatures. The acid chlorides of mono- and

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Study of the Phase Equilibria "Liquid - Vapor" in Systems Formed by $TiCl_4$ With Acid Chlorides of Mono- and Trichloroacetic Acids

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trichloroacetic acids were prepared by reacting thionyl chloride with the corresponding chloroacetic acids. The acid chlorides obtained were rectified twice. In the further course of their work, the authors made use of the fractions boiling within $\pm 0.1^{\circ}$ at constant temperature. Pure $TiCl_4$ was obtained from the commercial product by a double rectification. In the first rectification, this pure $TiCl_4$ was liberated from vanadium by means of copper chips. The fraction of $TiCl_4$ which distilled off at constant temperature, was subjected to the second rectification. The fraction, which distilled at constant temperature, was finally used. The products purified in this way are colorless liquids. The boiling temperatures of $TiCl_4$, $CH_2ClCOCl$, $CCl_3COCl$ amounted to $136.5^{\circ}$, $106^{\circ}$, $118.1^{\circ}$ at a pressure of 760 torr. The phase equilibria "liquid - vapor" and the vapor pressure determination of the pure components were studied by a method devised by L. A. Nisel'son and G. V. Seryakov (Ref. 3). The boiling points of $TiCl_4$, $CH_2ClCOCl$, $CCl_3COCl$ are tabulated in Table 1, and illustrated in

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Study of the Phase Equilibria "Liquid - Vapor" in Systems Formed by $TiCl_4$ With Acid Chlorides of Mono- and Trichloroacetic Acids

S/079/60/030/007/003/020
B001/B063

the coordinates log P, 1/T in Fig. 1; they fit the data of Ref. 4. The vapor pressures of the compounds examined in the above temperature range are represented by equations. Experimental data for the "liquid-vapor" equilibrium in the above systems are given in Table 2 and in the diagrams of Figs. 2,3. The relative volatilities were determined from these data, and the diagrams (Fig. 4) for the relative volatility and liquid composition are constructed. The system $TiCl_4$ - $CH_2ClCOCl$ differs markedly from the ideal one. This system apparently contains an azeotropic mixture (87% $CH_2ClCOCl$) and boils at 105°. The system $TiCl_4$ - $CCl_3COCl$, on the contrary, practically coincides with the ideal one. There are 4 figures, 2 tables, and 4 references: 1 Soviet and 1 German.

ASSOCIATION: Nauchno-issledovatel'skiy i proyektnyy institut redkometallicheskoy promyshlennosti (Scientific Research and Planning Institute for Industrial Rare Metals)

SUBMITTED: June 10, 1959

Card 3/3

SERYAKOV, G.V.; VAKS, S.A.; GOLOVANOV, I.M.

Determination of the total carbon content of titanium tetrachloride. Titan i ego splavy no.5:201-204 '61. (MIRA 15:2)
(Titanium chloride—Analysis)
(Carbon—Analysis)

SERYAKOV, G.V.; VAKS, S.A.; SIDORINA, L.S.

Investigating vapor-liquid phase equilibrium in systems formed by titanium tetrachloride with chloranhydride of mono- and trichloroacetic acids. Titan i ego splavy no.5:220-224 '61. (MIRA 15:2)

(Vapor-liquid equilibrium)
(Titanium compounds)

S/078/61/006/003/022/022
B121/B208

AUTHORS: Vaks, S. A., Seryakov, G. V., Nisel'son, L. A., Sidorina, L. S.

TITLE: Liquid-vapor equilibrium in systems formed from the tetrachlorides of titanium, silicon, and carbon

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 3, 1961, 756-758

TEXT: The equilibrium between liquid and vapor (at 760 mm Hg) in the systems $TiCl_4 - SiCl_4$, $TiCl_4 - CCl_4$, and $CCl_4 - SiCl_4$ was studied refractometrically at 20°C. The tetrachlorides had been purified by distillation, and the titanium and silicon chlorides also chemically. Data on the liquid-vapor equilibrium in the systems $TiCl_4 - SiCl_4$, $TiCl_4 - CCl_4$, and $CCl_4 - SiCl_4$ at 760 mm Hg are summarized in a table. The refractive index in the systems $TiCl_4 - CCl_4$ and $TiCl_4 - SiCl_4$ was found to be a linear function of the composition. In the system

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Liquid-vapor equilibrium...

S/078/61/006/003/022/022
B121/B208

$TiCl_4$ - $SiCl_4$, a negative deviation from Raoult's law was found on the side of the lower-boiling component. The system $TiCl_4$ - $CCl_4$ is nearly ideal, while the system $CCl_4$ - $SiCl_4$ distinctly differs from the ideal state with respect to the course of the interface between liquid and vapor. There are 4 figures, 1 table, and 3 references: 1 Soviet-bloc and 2 non-Soviet-bloc.

SUBMITTED: August 2, 1960

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| (1) Система $TiCl_4 - SiCl_4$ | | | | (1) Система $TiCl_4 - CCl_4$ | | | | (1) Система $CCl_4 - SiCl_4$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (2) Содержание $SiCl_4$, мол. % | | (3) | | (2) Содержание $CCl_4$, мол. % | | (3) | | (2) Содержание $SiCl_4$, мол. % | | (3) |
| t, °C | (a) в жидкой фазе, X | (b) в паровой фазе, Y | относительная летучесть [α] | t°, C | (a) в жидкой фазе, X | (b) в паровой фазе, Y | относительная летучесть [α] | t°, C | (a) в жидкой фазе, X | (b) в паровой фазе, Y | относительная летучесть [α] |
| 57,2 | 100 | 100 | — | 76,5 | 100 | 100 | — | 57,2 | 100 | 100 | — |
| 57,9 | 97,66 | 99,65 | 6,78 | 77,0 | 97,67 | 99,615 | 5,4 | 58,1 | 92,5 | 95,3 | 1,64 |
| 59,7 | 94,18 | 99,22 | 7,87 | 79,5 | 89,9 | 97,89 | 5,2 | 60,0 | 78,3 | 85,3 | 1,61 |
| 60,9 | 87,84 | 98,09 | 7,15 | 83,8 | 77,7 | 95,03 | 5,5 | 61,6 | 67,0 | 78,0 | 1,60 |
| 61,9 | 85,0 | 98,0 | 8,7 | 86,4 | 68,5 | 92,0 | 5,3 | 63,1 | 60,6 | 72,1 | 1,68 |
| 63,8 | 80,2 | 97,16 | 8,5 | 93,7 | 52,4 | 85,2 | 5,2 | 64,2 | 54,0 | 66,5 | 1,70 |
| 66,1 | 73,15 | 96,18 | 9,3 | 102,4 | 37,0 | 74,5 | 5,0 | 67,2 | 36,7 | 50,5 | 1,75 |
| 69,1 | 66,4 | 94,78 | 9,25 | 112,0 | 23,0 | 59,5 | 4,9 | 68,7 | 27,6 | 41,0 | 1,82 |
| 78,0 | 49,5 | 91,8 | 10,6 | 125,2 | 10,1 | 36,2 | 5,1 | 71,2 | 19,3 | 30,0 | 1,79 |
| 88,9 | 30,4 | 83,2 | 11,4 | 131,8 | 3,10 | 12,8 | 4,6 | 72,8 | 12,2 | 20,2 | 1,82 |
| 105,2 | 17,0 | 66,5 | 9,7 | 136,5 | 0 | 0 | — | 74,4 | 6,6 | 11,5 | 1,83 |
| 116,5 | 8,7 | 46,4 | 9,1 | | | | | 76,5 | 0 | 0 | — |
| 123,4 | 5,5 | 33,2 | 8,6 | | | | | | | | |
| 129,0 | 2,50 | 18,5 | 8,8 | | | | | | | | |
| 132,5 | 0,81 | 8,0 | 9,4 | | | | | | | | |
| 134,4 | 0,37 | 3,6 | 8,9 | | | | | | | | |
| 135,6 | 0,19 | 1,58 | 9,3 | | | | | | | | |
| 136,4 | 0 | 0 | — | | | | | | | | |

Legend to the Table:
1) system;
2) content, mole%;
a) in liquid phase;
b) in vapor phase;
3) relative fugacity.

SOV/56-35-1-30/59

AUTHORS: Vaks, V. G., Ioffe, B. L.

TITLE: On the $\pi \to e + \nu + \gamma$ Decay (O $\pi \to e + \nu + \gamma$-raspade)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 35, Nr 1, pp. 221-227 (USSR)

ABSTRACT: Gell-Mann and Feynman (Ref 1) suggested a scheme of universal weak interaction in which the interaction of nucleons with the electron-neutrino field is described by means of vectorial and axially-vectorial variants. Proceeding from the Hamiltonian developed for this case by Gell-Mann and Feynman, the authors investigated $\pi^{\pm} \to e^{\pm} + \nu + \gamma$ decay. On the assumption that direct interaction exists between $\pi$-mesons and the electron-neutrino field in the vector theory, the ratio between the probability of decay of the process under investigation and the probability of $\pi^0 \to 2\gamma$-decay can be exactly defined. For the ratio between the total probability for the decay $\pi \to e + \nu + \gamma$ and that of $\pi \to \mu + \nu$ -decay $5.10^{-6}$ is obtained, for $W^V_{\mu+\nu+\gamma} \sim 5.10^{-10} W_{\mu+\nu}$, and $W^{V+A}_{\pi \to e+\nu+\gamma}/W_{\mu+\nu} \approx$

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On the $\pi \to e + \nu + \gamma$ Decay

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$\approx 6.10^{-8}$. Finally, expressions are derived for the angular- and energy distribution of electrons and quanta. In conclusion the authors thank I.Yu. Kobzarev and L.B. Okun' for their valuable discussions.
There are 2 figures, 1 table, and 8 references, 2 of which are Soviet.

SUBMITTED: February 20, 1958

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21(1), 24(5) SOV/56-36-6-36/66

AUTHOR: Vaks, V. G.

TITLE: Radiative Deviations From the Coulomb Law at Small Distances (Radiatsionnyye otkloneniya ot zakona Kulona na malykh rasstoyaniyakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 6, pp 1882 - 1889 (USSR)

ABSTRACT: In the present paper the author investigates the radiative corrections to the Dirac equation in a Coulomb field for distances $r \ll \hbar/mc$. For an electron moving in an external field the radiation correction is composed of two totally different effects: Polarization of the electron-positron-vacuum by the external field, and interaction with fluctuations of the photon vacuum. The first-mentioned effect increases interaction, because the electron penetrates into the screening cloud, and within the range of applicability of the perturbation theory the potential of vacuum polarization may be set up according to Schwinger. The photon fluctuations, on the other hand, lead to a "trembling motion" of the electron which attenuates the coupling between the electron and the external field, thus decreasing interaction. These effects, especially the latter, are theoretically investigated. For the

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Radiative Deviations From the Coulomb Law at Small Distances SOV/56-36-6-36/66

purpose of investigating the deviations from the Coulomb law in the case of small r the Schwinger equation describing the motion of an electron in an external field is used as a basis. Calculations are carried out in the first order in $e^2/\hbar c$, and in the second in $Ze^2/\hbar c$. The resulting variation in the Coulomb singularity of the wave functions is found to be small and difficult to separate from the effect occurring as a result of the finite nuclear dimensions. There are 9 references, 2 of which are Soviet.

SUBMITTED: January 14, 1959

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SOV/56-37-2-20/56

24(5)

AUTHOR: Vaks, V. G.

TITLE: On Schemes With Indeterminate Metric

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 2(8), pp 467-469 (USSR)

ABSTRACT: This article is concerned with problems of unitarity and of macrocausality in the Lee-model with an indeterminate metric. The coordinates of the "heavy" N- and V-particles are assumed to be fixed. The Hamiltonian (not renormalized) takes the form: $H = -m_V \sum_i \psi^+_{V_i} \psi_{V_i} + \sum_{\vec{k}} \omega_k a^+_k a_k - g_o \sum_{\vec{k}} \frac{f_k}{\sqrt{2\omega_k}} (\psi^+_{V_i} \psi_{N_i} a_k e^{i\vec{k}\vec{R}_i} + \psi_{V_i} \psi^+_{N_i} a^+_k e^{-i\vec{k}\vec{R}_i})$, where $\psi^+_{V_i}, \psi_{V_i}, \psi^+_{N_i}, \psi_{N_i}$ denote the operators of V- and N-particle production and annihilation at the point $\vec{R}_i$; for the mass of the particle $m_N = 0$ holds; $g_o$ is an imaginary quantity and if the interaction is point-like, the cutoff factor $f_k \to 1$. The constants $m_V$ and $g_o$ should

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be so as to ensure that the denominator of the kernel of the Green's function of the V-particle

$$g_o^2 h(\varepsilon) = \varepsilon + m_V + g_o^2 \sum_{\vec{k}} \frac{f_k^2}{2\omega_k} \frac{1}{\omega_k - \varepsilon}$$

has a multiple zero at the point $E_o < \mu$. The author investigated the problem of the coupled states of a $\Theta$-particle in the field of the two particles $N_a$ and $N_b$ at an arbitrary distance $|\vec{R}_a - \vec{R}_b|$. The state vector takes the form $\Phi = c_a |V_a N_b\rangle + c_b |V_b N_a\rangle + \sum_{\vec{k}} \varphi_{\vec{k}} |N_a N_b \Theta_{\vec{k}}\rangle$. By means of solving the Schroedinger-equation $H\Phi = E\Phi$ a homogeneous system is obtained for the determination of $c_a$, $c_b$ in the bound states $E < \mu$. The dispersion curves $g_s(\varepsilon)$ and $g_{as}(\varepsilon)$ are given in a diagram. The existence of the second center naturally leads to a splitting of the "degenerate" term $E_o$. The function $g_s(\varepsilon)$ has no real zeros, $g_{as}(\varepsilon)$, however, has the real roots $E_1$ and $E_2$, $E_2$ having a negative norm. This result of the Lee-model gives rise to the assumption that in the deuteron problem there occur apparently states with a negative norm

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if the kernel of one nucleon has a multiple pole. According to N. N. Bogolyubov, B. V. Medvedev, and M. K. Polivanov (Ref 3) the state vector is a superposition of states with a negative and a positive norm. Every experiment, however, in which the difference of the physical quantities (as, for example, of the particle flux) is measured before and after the experiment, is not indicative of states with a negative norm, but the conservation of the total norm secures the unitarity of the S-matrix to be observed. The author shows that under these circumstances the condition of macrocausality no longer holds. This condition can be expressed by $S(A+B) = S(B)S(A)$ for remote centres, where $S(A)$, $S(B)$ and $S(A+B)$ are the S-matrices for the scatterers A, B, A+B. In the sequel the problem of the scattering of two Θ-particles on the remote particles $V_{af}$ and $N_b$ is solved, in limitation to the zero-th approximation with respect to $1/|\vec{R}_a - \vec{R}_b|$. The problem is best solved graphically, the solution being $\tilde{S}(A+B) = \tilde{S}(B)\tilde{S}(A) + R$. Another way of constructing the unitary matrix is outlined. According to the results of this paper the steady S-matrix for complex roots of $h(\varepsilon)$ is unitary without trivial disturbances of causality. The author expresses his gratitude to K. A.

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Ter-Martirosyan and L. A. Maksimov for constant interest in his work and for helpful discussion. There are 1 figure and 4 references, 1 of which is Soviet.

SUBMITTED: February 13, 1959

VAKS, V. G.

Cand Phys-Math Sci - (diss) "Several problems in the theory of weak and electromagnetic interactions." Moscow, 1961. 9 pp; (Order of Lenin Inst of Atomic Energy imeni I. V. Kurchatov of the Academy of Sciences USSR); 100 copies; price not given; bibliography at end of text (10 entries); (KL, 6-61 sup, 192)

VAKS, V.G.; LARKIN, A.I.

Using methods of the theory of superconductivity in problems pertaining to the masses of elementary particles. Zhur. eksp. i teor. fiz. 40 no.1:282-285 Ja '61. (MIRA 14:6)
(Supercohductivity) (Praticles (Nuclear physics))

22132

S/056/61/040/003/012/031
B112/B214

24.2500 (1143, 1144, 1482)

AUTHOR: Vaks, V. G.

TITLE: Electrodynamics of a zero-mass spinor particle

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 3, 1961, 792-800

TEXT: In some formulas in electrodynamics the mass appears in such a manner that a limit to the case of vanishing mass can not be obtained. The problem posed in this paper is about the general significance of mass in electrodynamics: Is there a mass of "electromagnetic origin"? Which properties have possible "solutions" of the existing theories? Are these properties consistent in the sense that there exist particles corresponding to them? The formulas appearing in Lorentz's electrodynamics do not involve the particle mass; they contain the "inertial" energy of the particle and are also valid for the case $m = 0$. A semiclassical estimate of the time dependence of $\varepsilon$ gives: $\varepsilon(t) = \varepsilon(o)\exp\{-(e_1^2/2\pi)\ln \varepsilon(o)t\}$ for $\varepsilon(o)t \gg 1$, where $e_1$ is the charge of the particle. The Dirac equation for a two com-

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ponent zero mass particle (neutrino) has the form: $\sigma(p - e_1 A)u(x) = 0$ if the state function u can be obtained from Dirac's total field function $\psi$ by the projection $u(x) = 1/2(1 - \gamma_5)\psi(x)$. The electromagnetic mass $\delta m$ is proportional to the bare mass $m_o$ so that $\delta m = 0$ for $m_o = 0$. The case of beta decay is considered next, and it is concluded that from the point of view of quantum mechanics a zero mass particle is unstable to the same degree as the electron. To a stable particle corresponds a pole of Green's function G(p) at the point $p_o = \varepsilon_p$. The renormalizing function for the transverse part of Green's function of the photon has the form:

$d_t(k^2) = (1 - \frac{e_1^2}{6\pi} \ln \frac{k^2}{k_o^2})^{-1}$. According to N. N. Bogolyubov, A. A. Logumov, and D. V. Shirkov, the mass appears in the electrical part of this expression. In the case of vacuum polarization, $d_t$ represents the first term of an expansion in terms of the external field. According to a rough empirical estimate it is found that $e_1 \lesssim 10^{-8}e$. A. I. Larkin is thanked

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for his help in the work; A. B. Migdal, V. M. Galitskiy, I.Ya.Pomeranchuk, and B. M. Pontekorvo are thanked for their interest. L. D. Landau and Ye. M. Lifshits are mentioned. There are 20 references: 16 Soviet-bloc and 4 non-Soviet-bloc.

SUBMITTED: August 3, 1960

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24710

S/056/61/040/005/010/019
B111/B205

24,2500

AUTHOR: Vaks, V. G.

TITLE: The asymptotic form of the vertex part in electrodynamics

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 5, 1961, 1366-1368

TEXT: The applies the method and notation of V. V. Sudakov (Ref. 1: ZhETF, 30, 87, 1956) and derives an expression for $\Gamma_\sigma^{(2)}$:

$$\Gamma_\sigma^{(2)} = \frac{3i}{4\pi}\gamma_\sigma \int \frac{du}{u} \int \frac{dv}{v} \left[ \frac{\theta(uv)\, i\pi}{\beta_l^{-1} - \ln uv} + f(|uv|) \right] =$$

$$= -\frac{3}{2}\gamma_\sigma \int_{\alpha_1}^{1} \frac{du}{u} \int_{\alpha_2}^{1} \frac{dv}{v} (\beta_l^{-1} - \ln uv)^{-1}, \qquad (3)$$

where $\theta(x)=0$ for $x<0$, and $\theta(x)=1$ for $x>0$, and also one for $\Gamma_\sigma^{(2u)}$:

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$$\Gamma_{\sigma}^{(2n)} = \frac{\gamma_0}{n!}\left[-\frac{3}{2}\int_{\alpha_1}^{1}\frac{du}{u}\int_{\alpha_2}^{1}\frac{dv}{v}(\beta_l^{-1} - \ln uv)^{-1}\right]^n \equiv \gamma_0\frac{(-J)^n}{n!}. \quad (5)$$

In view of the "infrared" smallness of the momentum of the essential quanta and on account of Eq. (5) one obtains

$$\Gamma_{\sigma} = \gamma_0 \exp(-J),$$

$$J = \frac{l3}{2}\Big[\Big(\beta^{-1} - \ln\frac{xy}{z}\Big)\ln\Big(\beta^{-1} - \ln\frac{xy}{z}\Big) + (\beta^{-1} - \ln z)\ln(\beta^{-1} - \ln z) -$$
$$-(\beta^{-1} - \ln x)\ln(\beta^{-1} - \ln x) - (\beta^{-1} - \ln y)\ln(\beta^{-1} - \ln y)\Big]. \quad (6)$$

where $z = -l^2/m^2$, $x = -p^2/m^2$, and $y = -q^2/m^2$. For $e^2 \ln z$ one obtains the result of Sudakov. In order to compute the low-order corrections to $\Gamma_{\sigma}$, it is necessary to make use of the renormalization-invariant

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expression $\frac{e^2}{3\pi} d_t(k^2) = \beta(1 - \beta \ln \frac{-k^2}{m^2})^{-1}$, from which Eq. (6) is derived as usual (Ref. 3: N. I. Bogolyubov, D. V. Shirkov, Vvedeniye v teoriyu kvantovannykh poley, Gostekhizdat, 1957, § 44). In this manner, it is likewise possible to calculate the logarithmic terms of the orders of $e^2 \ln (l^2/p^2)$ and $e^2 \ln(l^2/q^2)$. D. V. Shirkov is thanked for a discussion. V. Z. Blank and A. A. Abrikosov are mentioned.

SUBMITTED: November 22, 1960 (initially) and February 8, 1961 (after revision)

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VAKS, V.G.; LARKIN, A.I.

Particle mass in the one-dimensional model with four-fermion interaction. Zhur. eksp. i teor. fiz. 40 no.5:1392-1398 My '61. (MIRA 14:7)

(Particles (Nucleas physics))
(Nuclear models)

VAKS, V.G.

Branching of Green's functions of electrons and photons. Zhur. eksp. i teor. fiz. 40 no.6:1725-1727 Je '61. (MIRA 14:8)
(Potential, Theory of)
(Electrons)
(Photons)

26717
S/056/61/041/005/032/038
B102/B138

24.2140

AUTHORS: Vaks, V. G., Galitskiy, V. M., Larkin, A. I.

TITLE: Collective excitations in a superconductor

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 5(11), 1961, 1655 - 1668

TEXT: Quantum-field theory methods are applied to determine the spectrum of collective excitations in a superconductor. The collective excitations are investigated by means of the Green functions for zero temperatures. The excitations are treated as bound states of quasiparticles so that their spectrum can be determined from the pole of the two-particle Green function. The calculation of this function is based on the formal similarity of the problem to a one-dimensional relativistic one; The gap width plays the role of the mass and the proximity of the particle energy to that on the Fermi surface - that of the spatial momentum. For long-wave excitations the limiting frequencies and the dispersion of the oscillations are determined for any momentum 1. First the relativistic formalism is developed for the theory of superconductivity using P. L. Gor'kov's

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three types of Green functions (ZhETF, 34, 735, 1958). The real phase constant $\Delta$ is given by $\Delta = -i\int D(p-p')\frac{\Delta}{p'^2+\Delta^2}d^4p'$; $1 = -ig_0\int\frac{d^2p}{p^2+\Delta^2}$; $g_0 = \varrho\int D(\vec{n}\vec{n}')d\vec{n}'/4\pi$, $D(p-p') = D(\vec{n}\vec{n}')$, $\vec{n} = \vec{p}/p$, $\vec{n}' = \vec{p}'/p'$; D is phonon Green function. The Bethe-Salpeter equation for the two-particle Green functions whose poles determine the excitation spectrum is written in weak coupling approximation.

$$K_{\mu\nu} = \frac{i}{2}\left[\left(G\left(p+\frac{k}{2}\right)\gamma_3\right)_{\mu\rho}\left(\gamma_3 G\left(p-\frac{k}{2}\right)\right)_{\sigma\nu} + \right.$$
$$\left. + \left(CG\left(-p+\frac{k}{2}\right)\gamma_3\right)_{\nu\rho}\left(\gamma_3 G\left(-p-\frac{k}{2}\right)\right)_{\sigma\mu}\right] \times$$
$$\times \int d^4p'\left[D(p-p')K_{\rho\sigma}(p',k) - \frac{1}{2}D(k)\gamma^3_{\rho\sigma}\,\mathrm{Sp}\,\gamma^3 K(p',k)\right], \qquad (25)$$

with

$$\gamma_3 = \begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}, \quad \gamma_4 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad \gamma_5 = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}, \quad \gamma_1 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \quad C = \begin{pmatrix} \sigma_y & 0 \\ 0 & -\sigma_y \end{pmatrix} \quad (6)$$

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is found which can be solved only for certain relations between the energies $k_o = \omega$ and the momentum k of the excitation determining the spectrum $\omega(k)$. First the case k = 0 is treated. Here the general formulas

$$K^5_{lm} = \sum_{l_1} g_{l_1} \left[ (L + \beta^2 f)_{ll_1m} K^5_{l_1m} + \frac{q_4}{2\Delta} f_{ll_1m} K^3_{l_1m} + \frac{1}{2\Delta} (q_3 f)_{ll_1m} K^4_{l_1m} \right] - $$

$$- 2\delta_{m0} \rho D(k) \frac{q_4}{2\Delta} f_{l00} K^3_{00},$$

$$K^3_{lm} = \sum_{l_1} g_{l_1} \left[ \frac{q_4}{2\Delta} f_{ll_1m} K^5_{l_1m} - \left( f + \frac{q_3^2 - q_3^2 f}{q^2} \right)_{ll_1m} K^3_{l_1m} + q_4 \left( \frac{q_3 - q_3 f}{q^2} \right)_{ll_1m} K^4_{l_1m} \right] +$$

$$+ 2\delta_{m0} \rho D(k) \left( f + \frac{q_3^2 - q_3^2 f}{q^2} \right)_{l00} K^3_{00}, \qquad (30)$$

$$K^4_{lm} = \sum_{l_1} g_{l_1} \left[ -\frac{1}{2\Delta} (q_3 f)_{ll_1m} K^5_{l_1m} - q_4 \left( \frac{q_3 - q_3 f}{q^2} \right)_{ll_1m} K^3_{l_1m} - \left( \frac{q_3^2 - q_3^2 f}{q^2} \right)_{ll_1m} K^4_{l_1m} \right] +$$

$$+ 2\delta_{m0} \rho D(k)\, q_4 \left( \frac{q_3 - q_3 f}{q^2} \right)_{l00} K^3_{00}.$$

$$K^1_{lm} = \sum_{l_1} g_{l_1} (L - f + \beta^2 f)_{ll_1m} K^1_{l_1m}.$$

with $q_3 = knv$, $q_4 = i\omega$, $q^2 = q_3^2 + q_4^2$, $\beta^2 = -q^2/4\Delta^2$, $f(\beta) = \frac{\arcsin\beta}{\beta\sqrt{1-\beta^2}}$. (31)

change into

$$g_0 \frac{\omega^2}{4\Delta^2} f K_{00}^5 + \frac{i\omega}{2\Delta} f (g_0 - 2\rho D(\omega, 0)) K_{00}^3 = 0,$$ (32)

$$g_0 \frac{i\omega}{2\Delta} f K_{00}^5 - (1 + g_0 f - 2f\rho D(\omega, 0)) K_{00}^3 = 0.$$

and for frequencies with $l \neq 0$ into

$$K_{lm}^5 = g_l\left(L + \frac{\omega^2}{4\Delta^2} f\right) K_{lm}^5 + g_l \frac{i\omega}{2\Delta} f K_{lm}^3,$$ (33)

$$K_{lm}^3 = g_l \frac{i\omega}{2\Delta} f K_{lm}^5 - g_l f K_{lm}^3 .$$

For $g_1^2(g_2-g_1)^{-1} \ll 1$ the value of $\omega$ approaches $2\Delta$ and $f(\omega/2\Delta) \approx \frac{1}{2}\pi(1-\omega^2/4\Delta^2)^{-\frac{1}{2}}$ from which $\omega_1^2(0) = 4\Delta^2(1-\alpha_1^2)$ follows $\alpha_i = \frac{1}{2}\pi g_1^2(g_0-g_1)^{-1}$. In the case of $l = 0$ (sonic oscillations)

$$\frac{\pi\Delta}{2vk}\ln\frac{4\Delta^2}{4\Delta^2-\omega^2}-\left(\ln\frac{kv}{\Delta}-1\right)=0, \qquad (40)$$

$$2\Delta-\omega=\Delta\exp\left(-\frac{2kv}{\pi\Delta}\ln\frac{kv}{\Delta e}\right). \qquad (41)$$

is found for neutral particles. (30) changes into

$$\begin{aligned} K^5_{00} &= (1+g_0\beta^2 f)_{00}K^5_{00}+\frac{i\omega}{2\Delta}f_{00}(g_0-2pD(k))K^3_{00}, \\ K^3_{00} &= g_0\frac{i\omega}{2\Delta}f_{00}K^5_{00}+(2pD(k)-g_0)\left(f-\frac{(knv)^2(1-f)}{\omega^2-(knv)^2}\right)_{00}K^3_{00}. \end{aligned} \qquad (42)$$

which holds for an electron gas. For charged particles the dispersion of plasma oscillations is only weakly affected by superconductivity. For excitations with small k ($l \neq 0$, $kv \ll \alpha_1\Delta$) the system (30) can be solved as a system of independent equations. Since $\omega \approx 2\Delta$,

$$K^5_{lm} = g_l(L+f_{llm})K^5_{lm}+ig_lf_{llm}K^3_{lm},\quad K^3_{lm} = ig_lf_{llm}K^5_{lm}-g_lf_{llm}K^3_{lm} \qquad (45)$$



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is found and $\omega_{1m}^2(k) = 4\Delta^2(1-\alpha_1^2) + \frac{1}{3}k^2v^2(1 + 2C_{2o}^{1o}, {}_{1o}C_{2o,1m}^{1m})$, where C are Clebsch-Gordan coefficients. For large l, $\omega_{1m}^2(k) = \omega_1^2(0) + \frac{k^2v^2}{2}(1-m^2l^2)$ holds. For large k, instead of (30),

$$K_{10}^5 = g_1(L + f_{110})K_{10}^5 + if_{110}K_{10}^3, \quad K_{10}^3 = ig_1f_{110}K_{10}^5 - f_{110}K_{10}^3 \tag{49}$$

is valid. The edge of the spectrum is defined by $\omega(k_{max}) = 2\Delta$ and $k_{max} = 3\alpha_1\Delta/v$. Near $k_{max}$

$$(4\Delta^2 - \omega^2)\ln\frac{4\Delta^2}{4\Delta^2 - \omega^2} - \frac{v^2}{2}(k_{max}^2 - k^2) = 0. \tag{52}$$

holds, from which it may be seen that $\omega = 2\Delta$ is a tangent to the curve $\omega(k)$. For every $m \neq 0$ there will be one excitation branch which is not terminated even for large k. Eq. (30) can be substituted by

$$K_{lm}^5 = g_l L K_{lm}^5 + \frac{2\pi\Delta}{kv}P_{lm}(0)\ln\frac{\widetilde{kv}}{\sqrt{4\Delta^2-\omega^2}}\sum_{l_1} g_{l_1}P_{l_1m}(0)(K_{l_1m}^5 + iK_{l_1m}^3),$$

$$K_{lm}^3 = i\frac{2\pi\Delta}{kv}P_{lm}(0)\ln\frac{\widetilde{kv}}{\sqrt{4\Delta^2-\omega^2}}\sum_{l_1} g_{l_1}P_{l_1m}(0)(K_{l_1m}^5 + iK_{l_1m}^3). \tag{53}$$

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and

$$1 = \frac{4\Delta}{kv} \ln \frac{\widetilde{kv}}{\sqrt{4\Delta^2 - \omega^2}} \sum_l \alpha_l P_{lm}^2 (0), \tag{56}$$

$$4\Delta^2 - \omega^2 = \min\{k^2v^2, 4\Delta^2\} \cdot \exp\left[-\frac{kv}{2\Delta}\left(\sum_l \alpha_l P_{lm}^2 (0)\right)^{-1}\right]. \tag{57}$$

hold. For m = 0 and $\alpha_1 \Delta \ll kv \ll \Delta$

$$K_{l0}^5 = g_l L K_{l0}^5 + \frac{2\pi\Delta}{kv} P_{l0}(0) \ln \frac{kv}{\sqrt{4\Delta^2 - \omega^2}} \left[\sum_{l_1} g_{l_1} P_{l_10}(0)(K_{l_10}^5 + iK_{l_10}^3) - 2i\rho D(k) K_{00}^3\right],$$

$$K_{l0}^3 = \frac{2\pi\Delta}{kv} P_{l0}(0) \ln \frac{kv}{\sqrt{4\Delta^2 - \omega^2}} \left[\sum_{l_1} g_{l_1} P_{l_10}(0) (K_{l_10}^5 + iK_{l_10}^3) - 2i\rho D(k) K_{00}^3\right]. \tag{59}$$

is found. In this case no solution exists with an $\omega$ near $2\Delta$. All branches of excitations with m = 0 and $l \neq 0$ for small k near $2\Delta$ terminate at $kv \sim \alpha_1 \Delta$. All results hold for an isotropic model of a metal. The authors thank A. B. Migdal, S. T. Belyayev and L. P. Gor'kov for discussions.

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S/056/61/041/005/032/038
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Collective excitations in...

There are 2 figures and 19 references: 11 Soviet and 8 non-Soviet. The four most recent references to English-language publications read as follows: A. Bardasis, J. R. Schrieffer. Phys. Rev., 121, 1050, 1961; P. Anderson. Phys. Rev., 112, 1900, 1959; P. Anderson, P. Morel. Phys. Rev. Lett., 5, 136, 1960; J. Bardeen et al. Phys. Rev. 108, 1175, 1957.

SUBMITTED: June 15, 1961

Card 8/8

24.2140

37882
S/056/62/042/005/028/050
B102/B104

AUTHORS: Vaks, V. G., Galitskiy, V. M., Larkin, A. I.

TITLE: Collective excitations of particles with non-zero angular momentum pairing

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1319-1325

TEXT: In this contribution to the theory of superconductivity, systems are examined in which the attraction in a state with $l_0 \neq 0$ is dominant, as in the case of $He^3$ where the attraction in the D state is dominant (L. P. Pitayevskiy, ZhETF, 37, 1794, 1959). As well as those from single particles, collective excitations in such systems are examined. The shape of the excitation spectrum is important for explaining of superfluidity properties as well as for stability investigations. The equation for the gap $\Delta$ in the energy spectrum admits of general solutions only in the case of zero angular momentum pairing (two solutions: $\Delta = 0$, and $\Delta \neq 0$). Where non-zero moments are paired, special solutions must be sought. Collective excitations are examined here by a relativity technique as

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developed in a preparatory work (Vaks et al. ZhETF, 41, 1655, 1961). The system, which is assumed to be composed of fermions, coexists with sonic excitation and other excitations causing no gap in the energy spectrum. The scope is restricted to a graph of the first order $= \hat{\Sigma} = \Delta_1 + i\Delta_2\gamma_5$; ($\Delta_1 = \mathrm{Re}\,\Delta, \Delta_2 = \mathrm{Im}\,\Delta$). The fermion Green function $G(p) = 1/(i\hat{p} + \hat{\Sigma})$ becomes

$$G = \frac{1}{i\hat{p} + \Delta_1 + i\Delta_2\gamma_5} = \frac{-i\hat{p} + \Delta_1 - i\Delta_2\gamma_5}{p^2|\Delta|^2} \qquad (8).$$

for $\Delta_{1,2}$

$$\Delta_{1,2} = \rho\int D(nn')\frac{\Delta_{1,2}(n')}{p^2 + |\Delta(n')|^2}\frac{dn'}{4\pi}d^3p. \qquad (9)$$

is found and since $\Delta(p) = (\vec{n})$ is

$$\Delta(n) = \frac{1}{2}\rho\int D(nn')\ln\frac{\Lambda^2}{|\Delta(n')|^2}\Delta(n')\frac{dn'}{4\pi}, \qquad (10),$$

the energy width of the interaction range (10) can be inserted into a system of algebraic equations

$$\Delta^{lm} = g_l \sum_{l'm'} L^{lm}_{l'm'} \Delta^{l'm'}; \qquad (13)$$

$$L^{lm}_{l'm'} = \int dn Y^*_{lm}(n) \ln \frac{\Lambda}{|\Delta(n)|} Y_{l'm'}(n). \qquad (14).$$

The components with $l \neq l_o$ supply only a small correction having the order of magnitude $g_1^2 \Delta l_o (g_{l_o} - g_1)^{-1}$ so that the first approximation can be totalled only in terms of m, giving $\Delta^{l_o m} = \Delta^{l_o l_o}(1 - m^2/l_o^2)^{1/2}$. Most characteristics of collective excitations can be made recognizable without $\Delta(\vec{n})$. For two-particle excitations the Bethe-Salpeter equation can be given the form

$$\Gamma_\alpha(n, k) = \rho \int D(nn') \Pi_{\alpha\beta}(n'k) \Gamma_\beta(n', k) \frac{dn'}{4\pi},$$

$$\Pi_{\alpha\beta} = \frac{i}{4} \int d^4p \, \mathrm{Sp} \, \gamma_\beta G\left(p' - \frac{q}{2}\right) \gamma_2 \gamma_\alpha \gamma_2 G\left(p' + \frac{q}{2}\right). \qquad (20);$$

wherein $\Gamma_+ = \Gamma_1 + \Gamma_5$; $\Gamma_- = \Gamma_1 - \Gamma_5$; $\gamma_\pm = \gamma_1 \pm \gamma_5$; $\alpha$ and $\beta$ stand for + or -. If energy and moment are zero ($\omega = k = 0$) the equation for the change of the self-energy part of $\hat{\Sigma}$ coincides with the solution above mentioned: $\Gamma_\pm = \frac{1}{4}\,\mathrm{Sp}\,(1 \pm \gamma_5)\hat{\Sigma}'(n)$. As an example the case of the scalar pairing is examined when $D(\vec{n}\,\vec{n}')$ is independent of angle. $\Delta$ is assumed to be real so that $\Sigma' = \Delta i\alpha\gamma_5$, ($\gamma_5 = \begin{pmatrix}1 & 0\\ 0 & -1\end{pmatrix}$) and the given equation is valid when $\Gamma_+ = -\Gamma_-$. With gradient transformation $\hat{\Sigma} \to \hat{\Sigma} + i\alpha\gamma_5\hat{\Sigma}$ we have $\Gamma_+ = \Gamma_-^* = i\alpha\Delta$. The excitation spectrum with small k is obtained from the condition under which the following equation can be solved:

$$\sum_m \int dn \frac{\omega^2 - (vkn)^2}{|\Delta|^2}\left(2\Gamma_+^{*n}\Gamma_+^m + 2\Gamma_+^n\Gamma_+^{*m} - \frac{\Delta^{*2}}{|\Delta|^2}\Gamma_+^n\Gamma_+^m - \frac{\Delta^2}{|\Delta|^2}\Gamma_+^{*n}\Gamma_+^{*m}\right)c_m = 0 \qquad (29)$$

wherein $\omega$ is a linear function of k. A sonic branch always exists, the hydrodynamic velocity of the sound waves being $v/\sqrt{3}$. The velocity of other excitations depends on the direction of $\vec{k}$ and can be expressed in terms of $\Delta$ of the single particle excitation spectrum. As an example, the case examined by Anderson and Morel (Phys. Rev. 123, 1911, 1961) is

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taken, in which $\Delta(n) = \Delta_{22}Y_{22}(n)$. It can be shown that the solution with $\Delta \sim Y_{22}$ is unstable.

ASSOCIATION: Moskovskiy inzhenerno-fizicheskiy institut (Moscow Engineering Physics Institute)

SUBMITTED: December 14, 1961

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VAKS, V.G.; GALITSKIY, V.M.; LARKIN, A.I.

Collective excitations in paring in the case of non-zero angular momentum. Zhur. eksp. i teor. fiz. 42 no.5:1319-1325 My '62. (MIRA 15:9)

1. Moskovskiy inzhenerno-fizicheskiy institut.
(Angular momentum (Nuclear physics)) (Superconductivity)

S/056/62/043/001/025/056
B104/B102

AUTHORS: Baz', A. I., Vaks, V. G., Larkin, A. I.

TITLE: K-meson - hyperon resonances

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 1(7), 1962, 166 - 174

TEXT: Experimental data on the cross sections of the reactions
near the $\Sigma$ + K threshold are
$\pi^-$ + p $\longrightarrow \Sigma$ + K and $\pi^-$ + p $\longrightarrow \Lambda$ + K near the $\Sigma$ + K threshold are
phenomenologically analyzed. A level in the system $\Sigma$ + K with T = 1/2
with a binding energy of about 30 Mev is assumed to exist. In the cross
section of the reaction $\pi$ + N $\longrightarrow \Lambda$ + K; this level leads to a resonance
below the $\Sigma$ + K threshold. Possible levels in the systems $\Lambda$ + K, N + $\varrho$,
N + $\omega$, and N + K* are discussed. To clarify the interaction between $\Sigma$ and
K in states with T = 1/2, the cross sections of the reaction $\pi$ + N $\longrightarrow \Lambda$ + K
must be studied in the energy range $T_\pi$ = 810 - 900 Mev, and of the reac-
tion $\pi^-$ + p $\longrightarrow \Sigma$ + K, near the threshold. The analysis is conducted by
methods of R. Dalitz and S. Tuan (Ann. Phys., 8, 100, 1959; 10, 307, 1960;

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K-meson - hyperon resonances

Phys. Rev. Lett., 2, 425, 1959; Rev. Mod. Phys., 33, 471, 1961; Talk at Aix-en-Provence Int. Conf., September, 1961, preprint); unitarity, time reversal, and analycity of the scattering matrix are used for analyzing the $\overline{K}N$ interaction at small energies. There are 3 figures.

SUBMITTED: January 24, 1962

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S/056/62/043/005/042/058
B125/B104

AUTHOR: Vaks, V. G.

TITLE: Masses and charges of the excited states in the Fermi-Yang model

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 5(11), 1962, 1885-1896

TEXT: The Fermi-Yang equation

$$[(\alpha_p - \alpha_a)\, \mathbf{p} + M_p\beta_p + M_a\beta_a - V\,(1 - \alpha_p\alpha_a)]\, \Psi = E\Psi. \qquad (1)$$

for a rectangular potential well of radius $r_0$ is solved for arbitrary angular momenta and parities P in the case where proton and antineutron are of equal mass. The Dirac matrices $\alpha_{p,a}$ and $\beta_{p,a}$ act upon the spin indices of the proton p and antineutron a. V(r) is the interaction potential. The 16-component wave function $\Psi$ is written as a two-rowed matrix of the four-component quantities $\psi_i$. These $\psi_i$ are transformed like a product of

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the two-component spinors p and a. Lengthy calculations lead from Eq. (1) to

$$P = (-)^{l+1},\ s = 0: \quad R_l(k_1 r_0) = -Q_l(\varkappa r_0). \tag{12a}$$

$$P = (-)^{l+1},\ s = 1: \quad (E + 2V_0)^{-1}\,[ER_l(k_2 r_0) + 2jV_0] = -Q_l(\varkappa r_0). \tag{12b}$$

and

$$P = (-)^l,\ s = 1: \quad jV_0E\,[\varkappa^2(E + 2V_0)R_l(k_3 r_0) + E\left(\varkappa^2 - \frac{V_0E}{2}\right)Q_l(\varkappa r_0)] = 2\left[\varkappa^2 R_l(k_2 r_0) + \left(\varkappa^2 - \frac{V_0E}{2}\right)Q_l(\varkappa r_0)\right]\left[\varkappa^2(E + 2V_0)R_l(k_3 r_0) + E\left(\varkappa^2 - \frac{V_0E}{2}\right)Q_l(\varkappa r_0) - 2V_0(j+1)\right]. \tag{15a}$$

$$P = +1,\ j = 0,\ s = 1: \left(\varkappa^2 - \frac{V_0E}{2}\right)^{-1}\left[\varkappa^2\left(1 + \frac{2V_0}{E}\right)R_0(k_3 r_0) - \frac{2V_0}{E}\right] = -\varkappa r_0. \tag{15b}$$

with the ratios

$$R_l(z) = zJ_{l-1/2}(z)/J_{l+1/2}(z), \qquad Q_l(z) = zK_{l-1/2}(z)/K_{l+1/2}(z), \qquad (13)$$

$$k_1^2 = E\,(E/4 + V_0 + M^2/(2V_0 - E)),\ k_2^2 = (E/2 + V_0)\,(E/2 + V_0 - 2M^2/E).$$

of the Bessel functions for the eigenvalues E, i.e., for the mass $\mu$ of the compound bosons. These equations are solved numerically under the assumption that the mass of the lowest pseudoscalar state is equal to the pion mass ($\mu_\pi/2M$ = 0.0743). Here $\varkappa^2 = M^2 - E^2/4$ and $2M = M_p + M_a$. The $k_i^2$ are coefficients in the joining conditions. The numerical solutions of (12) and (15) give the following results for the lowest states j = 0,1,2 (cf. table): (1) The masses of the vector, tensor, pseudovector, and pseudotensor with spin s = 1 are less than the masses of the "pion" at $r_oM$ = 1, rapidly approaching zero when $r_o$ decreases further. (2) The levels for the pseudovector and pseudotensor with s = 1, and for the vector and tensor, are very close for every $r_o$, but the spacing between the levels

increases according to a power law with increasing $r_0$. (3) The lowest pseudovector is lighter than the vector for every $r_0$. The residue at the pole of the scattering amplitude of a "proton" by an "antineutron" is called the charge for the interaction with a compound boson. This residue ensues from the analytical continuation of the corresponding partial amplitude into the region $E < 2M$. The spinor amplitudes are calculated on the basis of the phase theory for the scattering of spin-1/2-particles. These charges grow rapidly with increasing $r_0$. At $s = 0$, and for a scalar, this growth is determined essentially by the exponential function $\exp(2\varkappa r_0)$. For $s = 1$ and $j \neq 0$, $\mu$ increases with increasing $r_0$, and $dk_2^2/dE \sim V_0 M/\mu^2$ decreases. Its high values at small $r_0$ give very small charges. The charges of the spin-zero bosons for all $r_0$ are much greater than the charges for $s = 1$. They increase with increasing principal quantum number. For given s the charge increases with increasing angular momentum j, so that the scalar has the highest charge. The properties of the excitation spectrum are not determined

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by the relativistic kinematics. The results of the Fermi-Yang equation are not supported by the Bethe-Salpeter equation for instantaneous interaction. This discrepancy applies in particular to the singularities of the type $V_0/E$ in the equations (12)-(15) for s = 1. There is 1 table.

SUBMITTED: June 11, 1962

Table. Legend: (1) principal quantum number, (2) pseudoscalar, (3) pseudovector, (4) pseudotensor, (5) scalar, (6) vector, (7) tensor.

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| $r_0 M$ | | 0,5 | | | 1 | | | 2 | | | 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_0/M$ | | 90,7 | | | 27,6 | | | 8,71 | | | 4,35 | | |
| $^{2s+1}L_J$ | 1 Главное квантовое число | $\mu/2M$ | $g^2/4\pi$ | $r$ | $\mu/2M$ | $g^2/4\pi$ | $r$ | $\mu/2M$ | $g^2/4\pi$ | $r$ | $\mu/2M$ | $g^2/4\pi$ | $r$ |
| 2 $^1S_0$ псевдоскаляр | 1<br>2 | 0,0743<br>0,507 | 0,16<br>0,20 | | 0,0743<br>0,430 | 0,71<br>0,80 | | 0,0743<br>0,358 | 5,7<br>7,5 | | 0,0743<br>1,325 | 39<br>57 | |
| 3 $^1P_1$ псевдовектор | 1 | 0,224 | 0,015 | | 0,194 | 0,10 | | 0,170 | 1,2 | | 0,160 | 9,6 | |
| 4 $^1D_2$ псевдотензор | 1 | 0,447 | 0,0031 | | 0,372 | 0,044 | | 0,305 | 0,57 | | 0,276 | 8,7 | |
| 3 $^3P_1$ псевдовектор | 1<br>2 | 0,011133<br>0,011135 | $2,2\cdot10^{-11}$<br>$7,3\cdot10^{-11}$ | | 0,0371<br>0,0392 | $1,7\cdot10^{-9}$<br>$6,6\cdot10^{-9}$ | | 0,121<br>0,139 | $1,7\cdot10^{-4}$<br>$1,0\cdot10^{-4}$ | | 0,243<br>0,303 | 0,058<br>0,44 | |
| 4 $^3D_2$ псевдотензор | 1 | 0,0112 | $7,1\cdot10^{-17}$ | | 0,0378 | $2,2\cdot10^{-10}$ | | 0,127 | $1,0\cdot10^{-6}$ | | 0,261 | 0,030 | |
| 5 $^3P_0$ скаляр | 1 | 0,440 | $1,1\cdot10^{-8}$ | — | 0,398 | 0,024 | — | 0,384 | 0,17 | — | 0,443 | 1,7 | — |
| 6 $(S+D)_1$ вектор | 1<br>2 | 0,0112<br>0,0115 | $1,3\cdot10^{-7}$<br>$3,6\cdot10^{-7}$ | 0,022<br>0,023 | 0,0378<br>0,0405 | $4,1\cdot10^{-6}$<br>$1,2\cdot10^{-4}$ | 0,076<br>0,081 | 0,126<br>0,148 | 0,019<br>0,062 | 0,27<br>0,33 | 0,252<br>0,284 | 0,47<br>1,1 | 0,73<br>0,38 |
| 7 $(P+F)_2$ тензор | 1 | 0,0113 | $7,9\cdot10^{-10}$ | 0,023 | 0,0386 | $9,5\cdot10^{-7}$ | 0,077 | 0,133 | $1,5\cdot10^{-8}$ | 0,28 | 0,276 | 0,42 | 0,72 |

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VAKS, V.G.; LARKIN, A.I.

Regge poles in the nonrelativistic problem assuming nonlocal and singular interaction. Zhur. eksp. i teor. fiz. 45 no.3: 800-809 '63. (MIRA 16:10)

1. Institut atomnoy energii AN SSSR.
(Potential, Theory of)
(Particles (Nuclear physics))

VAKS, V.G.; LARKIN, A.I.

Amplitude characteristics at $\ell = -1$ in the Bethe - Salpeter equations. Zhur. eksp. i teor. fiz. 45 no.4:1087-1101 O '63. (MIRA 16:11)

L 1837-66 EWT(1)/T IJP(c) GG UR/3136/65/000/863/0001/0019

ACCESSION NR: AT5022310

AUTHOR: Vaks, V.G.; Larkin, A.I.; Ovchinnikov, Yu. N.

TITLE: The Ising model in the interaction with other than the closest neighbors

SOURCE: Moscow. Institut atomnoy energii. Doklady, IAE-863, 1965. Model' Izinga pri vzaimodeystvii s neblizhayshimi sosedyami, 1-19

TOPIC TAGS: ferroelectric crystal, second order phase transition, correlation function, free energy, spontaneous magnetization

ABSTRACT: The Ising model consists of a lattice of dipoles, each of which assumes only two positions and interacts only with its closest neighbors. It was of interest to determine the extent to which the results are sensitive to the form of the model, particularly whether the singularities in the macroscopic quantities and the form of the correlation function change when the interaction with neighbors other than the closest ones is taken into account. A two-dimensional Ising lattice is considered in which, in addition to the usual interactions, there is an interaction along the diagonals between lattice points with the same parity of rows and columns. The free energy and spontaneous magnetization were determined as functions of temperature. A form of the correlation function was obtained at large distances at the phase transition point and

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in its vicinity. It was found that the singularities in the macroscopic quantities at the transition point remain the same as in the Ising model. The only difference of the model studied from the Ising model is that for a certain ratio of the constants, three successive phase transitions exist in the system as the temperature changes. "The authors thank G. V. Ryazanov for communicating the results of his study (G. V. Ryazanov, ZhETF, 1965) of the asymptotic behavior of G(r), and N. V. Vdovichenko for drawing our attention to his paper (N. V. Vdovichenko, ZhETF 48, 526, 1965) prior to its publication." Orig. art. has: 2 figures and 43 formulas.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: SS

NO REF SOV: 006 OTHER: 008

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APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001858410019-4"

L 1929-66 EWT(l)/EWT(m)/T/EWP(t)/EWP(b)/EWA(c) IJP(c) JD/JW/GG

ACCESSION NR: AT5022284 UR/3136/65/000/864/0001/0023

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C+1

AUTHOR: Vaks, V. G.; Larkin, A. I.

TITLE: Second-order phase transitions

SOURCE: Moscow. Institut atomnoy energii. Doklady, IAE-864, 1965. O fazovykh perekhodakh vtorogo roda, 1-23

TOPIC TAGS: second order phase transition, thermodynamic property, Bose Einstein statistics, quantum mechanics, alloy, heat capacity, ferroelectric crystal

ABSTRACT: Second-order phase transitions involving a change in crystal symmetry in binary alloys and in a Bose gas are treated statistically. With certain assumptions concerning the relationship between the interaction constants, it is shown that a specific part of the thermodynamic quantities has the same form as in the Ising model or in its complex variants. All these models can be studied with relative ease by means of computers. A series of results have already been obtained for the standard three-dimensional Ising lattice, and these results can be compared with the observed changes in macroscopic quantities near the transition. The phase transition in a Bose gas turns out to be equivalent to the transition in a lattice of flat dipoles. In conclusion, further computations which would be desirable for checking the suitability of the approximations

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ACCESSION NR: AT5022284

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employed and for comparison with experimental data are discussed. "The authors thank V. M. Galitskiy, who participated in the initial stage of this work, and L. P. Pitayevskiy, V. L. Pokrovskiy, and A. A. Vedenov for reviewing the results." Orig. art. has: 46 formulas.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: SS, GP

NO REF SOV: 007 OTHER: 009

Card 2/2

L 12178-66 EWT(m)/T/EWP(t)/EWA(c)/EWP(b) JD/JW

ACC NR: AP5024720 SOURCE CODE: UR/0056/65/049/003/0975/0989

AUTHORS: Vaks, V. G.; Larkin, A. I.

ORG: None

TITLE: Phase transitions of second order

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 3, 1965, 975-989

TOPIC TAGS: second order phase transition, binary alloy, crystal symmetry

ABSTRACT: The article is devoted to a statistical study of second-order phase transitions in binary alloys with changes of crystal symmetry and in a Bose gas. Under certain assumption concerning the interaction constants and for certain relations between the parameters, it is shown that the singular parts of the thermodynamic quantities are of the same form as in the Ising model or its generalizations, for which a number of results are known from computer calculations. In particular, the results known for the three-dimensional Ising lattice are compared with the behavior of the observed macroscopic quantities near the transition point. The accuracy of the calculations and the desirability of further computer

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APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001858410019-4"

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ACC NR: AP5024720

calculations for the purpose of checking the approximation made and for comparison with experiments are discussed. Arguments are presented to show that subsequent terms do not alter the already obtained results. A phase transition in a Bose gas is found to be equivalent to a transition in a lattice of plane dipoles. Authors are grateful to V. M. Galitskiy for participating in the initial stages of the work, and to L. P. Pitayevskiy, V. L. Pokrovskiy, and A. A. Vedenov for discussions.

SUB CODE: 20/ SUBM DATE: 21Apr65/ NR REF SOV: 007/ OTH REF: 009

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L 12783-66 EWT(1)

ACC NR: AP5026611 SOURCE CODE: UR/0056/65/049/004/1180/1189

AUTHORS: Vaks, V. G.; Larkin, A. I.; Ovchinnikov, Yu. N.

ORG: None

TITLE: Ising model with interaction between nonnearest neighbors

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 4, 1965, 1180-1189

TOPIC TAGS: correlation function, free energy, spontaneous magnetization

ABSTRACT: To check on the sensitivity of the results of the standard Ising model to the actual form of the model, especially with respect to the nature of singularities of the different macroscopic quantities and the form of the correlation function, the authors consider a modification of the Ising model in the form of a two-dimensional lattice in which, besides the usual interaction, there is an interaction between certain non-nearest neighbors, along diagonals between nodes with equal row-plus-column parities. The free energy and the spontaneous magnetization are determined as functions of the temperature. The form of the correlation function at large distances is derived at and close to the

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L 12783-66

ACC NR: AP5026611

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phase-transition point. The singularities in the macroscopic quantities are found to be the same as in the Ising model, nor is there any change in the behavior of the correlation function near the transition point. The only difference between the authors' model and the Ising lattice is that for a certain ratio of the system constants there are three successive phase transitions as the temperature is varied. Authors thank G. V. Ryazanov and N. V. Vdovichenko for preliminary information about their current work. Orig. art. has: 2 figures and 44 formulas.

SUB CODE: 20/ SUBM DATE: 21Apr65/ NR REF SOV: 006/ OTH REF: 008

Card 2/2 HW

L 08179-67 EWT(1)
ACC NR: AP6024896 SOURCE CODE: UR/0056/66/051/001/0361/0375

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56

AUTHOR: Vaks, V. G.; Larkin, A. I.; Pikin, S. A.

ORG: none

TITLE: On the self-consistent field method in the description of phase transitions

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 1, 1966, 361-375

TOPIC TAGS: phase transition, correlation function, thermodynamic function, crystal symmetry, ferroelectric material, dipole interaction, superconductivity

ABSTRACT: The purpose of the investigation was to determine the region of applicability of the Landau phenomenological theory for phase transitions, inasmuch as this theory disagrees with experiment in the direct vicinity of the phase transition point. Since the phenomenological theory is equivalent to the zeroth approximation of the self consistent field method from the microscopic point of view, the authors consider the phase transitions in an Ising model and in crystals for a large interaction radius $r_0$. Then the method of constructing the successive approximations is illustrated with the Ising model as an example. The first two terms of the expansion in terms of the parameter $r_0^{-3}$ are obtained in the correlation function and in the thermodynamic quantities. The methods developed for the Ising model are then applied to the more complicated case of phase transitions accompanied by a change in crystal symmetry. The influence of the electric dipole-dipole interaction in ferroelectrics is analyzed and

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ACC NR: AP6024896

it is shown that the results of the phenomenological theory are valid in a wide range of temperatures. The question of the phase transitions in one-dimensional systems is considered. It is shown that as the temperature approaches the transition temperature, the parameter $r_0^{-3}$ increases like $r_0^{-3}|T - T_c|^{-1/2}$ for forces of finite radius and like $r_0^{-3}\ln|T - T_c|$ for dipole-dipole interaction in uniaxial ferroelectrics. The results show that when the interaction radius is large, $r_0 \gg 1$, the self-consistent approximation describes the phase transitions in crystals and in the Ising model correctly everywhere except a narrow region near the transition point. The phenomenological theory is best applicable to superconductors, where the role of the interaction radius is played by the pair dimension. The authors thank A. P. Levanyuk for a useful discussion. Orig. art. has: 51 formulas.

SUB CODE: 20/ SUBM DATE: 25Feb66/ ORIG REF: 015/ OTH REF: 005

Card 2/2 nst

SOURCE CODE: UR/0056/66/051/005/1592/1608

ACC NR: AP6037090

AUTHOR: Vaks, V. G.; Galitskiy, V. M.; Larkin, A. I.

ORG: none

TITLE: Collective excitations near second order phase transition points

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 5, 1966, 1592-1608

TOPIC TAGS: second order phase transition, crystal lattice vibration, permitivity, excitation spectrum, ferroelectricity

ABSTRACT: The authors present a microscopic treatment of critical excitations in solids with temperature-dependent frequency, which tends to zero on approaching the transition point. The theory developed makes it possible to explain the region of existence of the critical vibrations and the physical meaning of the phenomenological parameters employed. Simple models, which are not related to any specific substance but which include all the essential properties of the real crystals, are considered. The interaction radius is assumed to be large enough to permit the use of the self-consistent field method. This method is then used to determine the spectrum of these excitations and the dispersion of the dielectric permitivity in ferroelectric transitions. A diagram technique, which makes it possible to calculate further approxima-